

CLAIMS

1. A catalyst for copolymerization of olefins and styrenes, which comprises:

- (A) a transition metal compound,
- (B) an oxygen-containing compound,
- (C) a compound of a general formula (1):



wherein R^1 represents a hydrogen atom, a halogen atom, an aliphatic hydrocarbon group having from 1 to 30 carbon atoms, an aromatic hydrocarbon group having from 6 to 30 carbon atoms, an alkoxy group having from 1 to 30 carbon atoms, an aryloxy group having from 6 to 30 carbon atoms, a thioalkoxy group having from 1 to 30 carbon atoms, a thioaryloxy group having from 6 to 30 carbon atoms, an amino group, an amido group, or a carboxyl group, R^1 's may be the same or different, and R^1 's may be optionally bonded to each other to form a cyclic structure; X represents an element of Group 14; Y represents an element of Group 16; Z represents a metal element of Groups 2 to 13; R^2 represents a hydrocarbon group; m is an integer, indicating the valency of the metal element Z; and n is an integer of from 1 to (m-1),

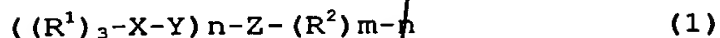
and optionally,

- (D) an alkylating agent.

2. A catalyst for copolymerization of olefins and styrenes, which comprises:

(A) a transition metal compound,

(C) a compound of a general formula (1):



wherein R^1 represents a hydrogen atom, a halogen atom, an aliphatic hydrocarbon group having from 1 to 30 carbon atoms, an aromatic hydrocarbon group having from 6 to 30 carbon atoms, an alkoxy group having from 1 to 30 carbon atoms, an aryloxy group having from 6 to 30 carbon atoms, a thioalkoxy group having from 1 to 30 carbon atoms, a thioaryloxy group having from 6 to 30 carbon atoms, an amino group, an amido group, or a carboxyl group, R^1 's may be the same or different, and R^1 's may be optionally bonded to each other to form a cyclic structure; X represents an element of Group 14; Y represents an element of Group 16; Z represents a metal element of Groups 2 to 13; R^2 represents a hydrocarbon group; m is an integer, indicating the valency of the metal element Z; and n is an integer of from 1 to (m-1),

and optionally,

(D) an alkylating agent.

506A, 7 3. The catalyst of above 1 or 2 for copolymerization of olefins and styrenes, wherein, in (C), X is carbon, Y is oxygen and Z is aluminium.

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4. The catalyst of above 1 or 2 for copolymerization of olefins and styrenes, wherein the compound (C) is a reaction product of <1> at least one selected from compounds of a general formula, $(R^1)_3-C-OR^3$, R^4-CO-R^5 or $R^6-CO-OR^7$, with <2> a compound of a general formula, $Z(R^2)_m$. (In these formulae, R^1 , R^3 , R^4 , R^5 , R^6 and R^7 each represent a hydrogen atom, a halogen atom, an aliphatic hydrocarbon group having from 1 to 30 carbon atoms, an aromatic hydrocarbon group having from 6 to 30 carbon atoms, an alkoxy group having from 1 to 30 carbon atoms, an aryloxy group having from 6 to 30 carbon atoms, a thioalkoxy group having from 1 to 30 carbon atoms, a thioaryloxy group having from 6 to 30 carbon atoms, an amino group, an amido group, or a carboxyl group, and R^1 , R^3 , R^4 , R^5 , R^6 and R^7 may be the same or different, and R^1 , R^3 , R^4 , R^5 , R^6 and R^7 may be optionally bonded to each other to form a cyclic structure; Z represents a metal element of Groups 2 to 13; m is an integer, indicating the valency of the metal element Z; and R^2 represents a hydrocarbon group.)

5. A catalyst for copolymerization of olefins and styrenes, which comprises:

(A) a transition metal compound,

(B) an oxygen-containing compound, and/or a compound capable of reacting with a transition metal compound to form an ionic complex,

(C1) at least one selected from compounds of a general

formula, $(R^1)_3-C-OR^3$, R^4-CO-R^5 or $R^6-CO-OR^7$ (In these formulae, R^1, R^3, R^4, R^5, R^6 and R^7 each represent a hydrogen atom, a halogen atom, an aliphatic hydrocarbon group having from 1 to 30 carbon atoms, an aromatic hydrocarbon group having from 6 to 30 carbon atoms, an alkoxy group having from 1 to 30 carbon atoms, an aryloxy group having from 6 to 30 carbon atoms, a thioalkoxy group having from 1 to 30 carbon atoms, a thioaryloxy group having from 6 to 30 carbon atoms, an amino group, an amido group, or a carboxyl group, and R^1, R^3, R^4, R^5, R^6 and R^7 may be the same or different, and R^1, R^3, R^4, R^5, R^6 and R^7 may be optionally bonded to each other to form a cyclic structure.)

(C2) a compound of a general formula, $Z(R^2)_m$. (In this formula; Z represents a metal element of Groups 2 to 13; m is an integer, indicating the valency of the metal element Z; and R^2 represents a hydrocarbon group.)

and optionally,

(D) an alkylating agent.

6. A catalyst for copolymerization of olefins and styrenes, which comprises:

(A) a transition metal compound,

(C1) at least one selected from compounds of a general formula, $(R^1)_3-C-OR^3$, R^4-CO-R^5 or $R^6-CO-OR^7$ (In these formulae, R^1, R^3, R^4, R^5, R^6 and R^7 each represent a hydrogen atom, a halogen atom, an aliphatic hydrocarbon group having from 1 to 30 carbon atoms, an aromatic hydrocarbon group having from 6 to 30 carbon

atoms, an alkoxy group having from 1 to 30 carbon atoms, an aryloxy group having from 6 to 30 carbon atoms, a thioalkoxy group having from 1 to 30 carbon atoms, a thioaryloxy group having from 6 to 30 carbon atoms, an amino group, an amido group, or a carboxyl group, and R^1, R^3, R^4, R^5, R^6 and R^7 may be the same or different, and R^1, R^3, R^4, R^5, R^6 and R^7 may be optionally bonded to each other to form a cyclic structure.

(C2) a compound of a general formula, $Z(R^2)_m$, wherein Z represents a metal element of Groups 2 to 13; m is an integer, indicating the valency of the metal element Z; and R^2 represents a hydrocarbon group, and optionally,

(D) an alkylating agent.

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7. The catalyst of any of above 1 to 6 for copolymerization of olefins and styrenes, wherein at least one of three R^1 's is an aromatic hydrocarbon group having from 6 to 30 carbon atoms.
 8. The catalyst of any of above 1 to 6 for copolymerization of olefins and styrenes, wherein three R^1 's are all aromatic hydrocarbon groups each having from 6 to 30 carbon atoms.
 9. The catalyst of any of above 1 to 6 for copolymerization of olefins and styrenes, wherein three R^1 's are all phenyl groups.
 10. The catalyst of any of above 1 to 9 for copolymerization of olefins and styrenes, wherein R^2 is an alkyl group having

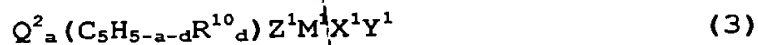
at least 2 carbon atoms.

11. The catalyst of any of above 4 to 10 for copolymerization of olefins and styrenes, wherein Z is aluminium.

12. The catalyst of any of above 1 to 11 for copolymerization of olefins and styrenes, wherein the transition metal compound

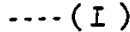
(A) is represented by any of the following general formulae

(2) to (6):

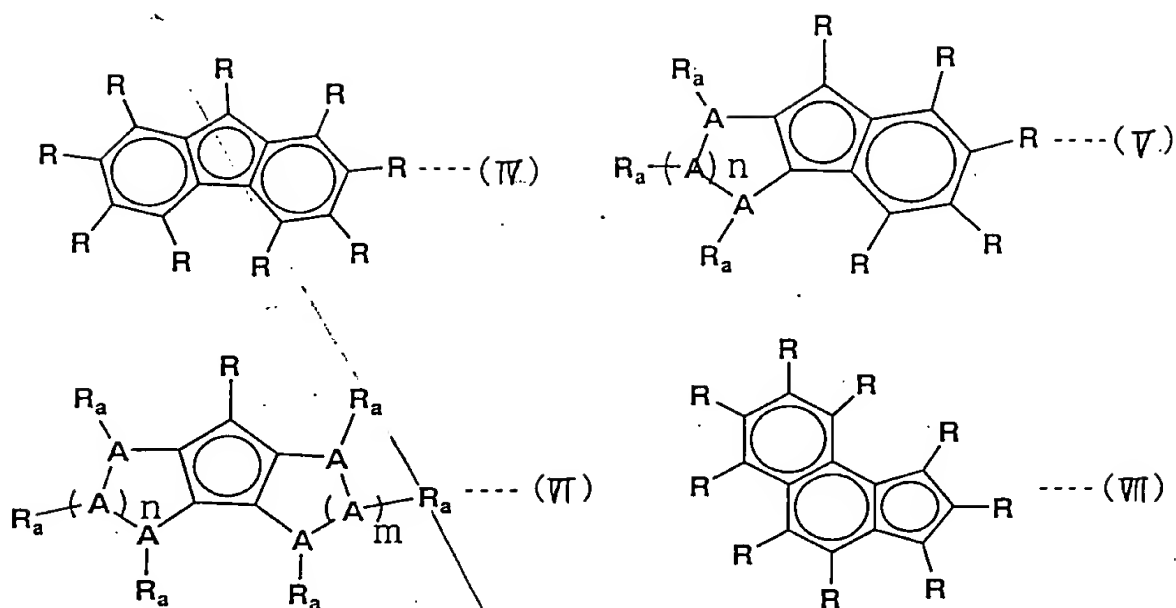


in which Q^1 represents a bonding group that crosslinks the two conjugated five-membered cyclic ligands $(C_5H_{5-a-b}R^8_b)$ and $(C_5H_{5-a-c}R^9_c)$; Q^2 represents a bonding group that crosslinks the conjugated five-membered cyclic ligand $(C_5H_{5-a-d}R^{10}_d)$ and the group Z^1 ; R^8 , R^9 , R^{10} and R^{11} each represent a hydrocarbon group, a halogen atom, an alkoxy group, a silicon-containing hydrocarbon group, a phosphorus-containing hydrocarbon group, a nitrogen-containing hydrocarbon group, or a boron-containing hydrocarbon group; and a plurality of these groups, if any, may be the same or different, and may be bonded to each other to form a cyclic structure; a represents 0, 1 or 2; b, c and d each represent an integer of from 0 to 5 when a = 0, or an integer of from 0 to 4 when

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 A^2 

2
A



wherein A represents an element of Group 13, 14, 15 or 16, and plural A's may be the same or different; R represents a hydrogen atom, a halogen atom, an aliphatic hydrocarbon group having from 1 to 30 carbon atoms, an aromatic hydrocarbon group having from 6 to 30 carbon atoms, an alkoxy group having from 1 to 30 carbon atoms, an aryloxy group having from 6 to 30 carbon atoms, a thioalkoxy group having from 1 to 30 carbon atoms, a thioaryloxy group having from 6 to 30 carbon atoms, an amino group, an amido group, a carboxyl group, or an alkylsilyl or alkylsilylalkyl group having from 3 to 30 carbon atoms, and R's may be the same or different, and may be optionally bonded to each other

to form a cyclic structure; a represents 0, 1 or 2; and n and m each represent an integer of at least 1.

14. A method for producing olefin-styrene copolymers, which comprises polymerizing olefins and styrenes in the presence of the copolymerization catalyst of any of above 1 to 13.

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